CONFERENCE OF THE COMMITTEE ON DISARMAMENT

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Working Paper on Toxins

1. The United States has renounced the production, stockpiling and use of toxins, and has confined its military programme on toxins to research and development for defensive purposes only. Thus, the United States policy on toxins is identical to its policy on biological programmes.

2. Toxins are poisonous substances produced by biological organisms, including microbes, animals, and plants. Examples of microbial toxins are botulinum toxin, staphylococcus enterotoxin, diphtheria toxin, and tetanus toxin. Toxins produced by animals include puffer fish poison, snake and bee venom, and shellfish poison. Plant toxins include ricin, produced by the caster oil plant, cicutoxin produced by the poison hemlock, and abrin, produced by the Indian licorice seed plant. Laboratory experimentation has shown that, in general, these naturally occurring poisons are far more toxic than the known nerve agents.

3. Two bacterial toxins, botulinum toxin and staphylococcal enterotoxin, have long been discussed as potential agents of warfare. The botulinum toxin is one of the most poisonous substances known to science, and has been estimated to be up to 10,000 times as poisonous as nerve agents. For comparison purposes, if 15 tons of nerve agent would cause 50 per cent deaths over an area of up to 60 square kilometers, then about one and one-half kilograms of botulinum toxin would theoretically produce the same effect. Or, 15 tons of botulinum toxin could theoretically cause 50 per cent deaths in an unprotected population in an area up to 600,000 square kilometers. Effectiveness would of course depend upon dissemination technology, and actual coverage could vary significantly. Consequently, because of their inherently different characteristics (for example, toxicity), toxins and nerve agents have different possible military roles.

4. Where the target population is without protection, toxins could be delivered in a given area with relatively limited logistical effort. Even when masked, the target population would not be certain of protection against toxins because their extremely low dose rate would make masks with minor leaks ineffective, although effective masks would provide substantial protection.

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5. In contrast to the biological organisms from which they are produced, toxins are not living organisms and are not capable of reproducing themselves. For this reason, the disease or poisoning caused by toxins is not transmissible from man to man. Thus, toxins cannot cause infectious disease, epidemics, or long-term sources of illness. Consequently toxins could create mass casualties among an adversary's population without risk of spreading to infect the nation initiating use of toxins. The characteristic symptoms of many bacterial diseases are caused by the toxins produced within the human body by living bacteria. Examples of diseases that can be produced by toxins are botulism, tetanus, diphtheria and staphylococcal food poisoning.

6. In common with biological agents, toxins generally have delayed poisonous effects. Their delayed action varies with the particular toxin. Because of their high potency, the effective dosage in man is extremely small if he is neither masked nor immunized. Toxins, if used as weapons, could be dispersed in aerosol form at considerable distances from the target and could cover a very large area, resembling the large areas that could be covered by biological agents. Casualties would therefore result after the target population had been subjected to extremely small quantities of the toxin.

7. With regard to the effects of toxins, botulinum toxin produces botulism, an acute and highly fatal disease. There are at present six types of this toxin of which four are known to be toxic for man. The disease, botulism, is characterized by the combination of extreme weakness, vomiting, thirst, fever, dizziness, blurred vision, dilated pupils, facial paralysis and weakness of respiratory muscles. Death is attributable to paralysis, respiratory failure, and associated cardiac arrest. These symptoms do not appear for 12 to 72 hours.

8. All persons are susceptible to the disease, which occurs naturally throughout the world. While almost completely effective immunization is possible, such measures would be effective only if administered well before any exposure. The mortality rate for naturally occurring botulism in the United States is approximately 65 percent. If effectively weaponized and delivered in a highly purified state, botulinum toxin could have a mortality rate approaching 100 percent. The toxin could be delivered either as an aerosol or through contamination of water supplies.

9. Staphylococcal enterotoxin is a stable protein which produces an acute incapacitation known as staphylococcal food poisoning. It is characterized by severe nausea, vomiting, abdominal pain, diarrhea, and prostration. Its effects generally last for 24 hours.

10. A plant toxin thought to have potential military utility is ricin, which is extracted from the caster bean. The lethal dose of ricin in man is not know, but it is estimated from animal studies to be about 80 millionths of a gram for the average man. Ricin causes death by paralysis.

11. The production of bacterial toxins in any significant quantity would require facilities similar to those needed for the production of biological agents. Though toxins of the type useful for military purposes could conceivably be produced by chemical synthesis in the future, the end products would be the same in the effects of their use and those effects would be indistinguishable from toxins produced by bacteriological or other biological processes.